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### Nitinol Surface Characteristics and Corrosion Behavior in Various Passivation Media

*K. Abedi*

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### Surface Treatment Dependent Corrosion Resistance of Nitinol Wires after Deformation

*S. Zende<sup>1</sup>, A. Undisz<sup>2</sup>, K.E. Freiberg<sup>2</sup>, F. Dorner<sup>1</sup>, and N. Feth<sup>1</sup>*

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*(2)Friedrich Schiller University, Jena, Germany*

### The Effects of Nitinol Purity and Surface Finish on Corrosion Susceptibility

*S. Nagaraja<sup>1</sup>, P. Stafford<sup>2</sup>, C. Braeuner<sup>3</sup>, M. Di Prima<sup>2</sup>, G. Sena<sup>4</sup>, V.A. Ravi<sup>4</sup>, and A.R. Pelton<sup>1</sup>*

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*(3)Admedes GmbH, Pforzheim, Germany*

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### Role of a Computer Aided Analysis in the Electropolishing Processes

*A. Franczak*

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### Exploring the Fretting-Corrosion Mechanisms of NiTi in a Simulated Biological Environment

*Michael Bryant*

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### Wear of Nitinol Wires as a Function of Nitinol Micro-Cleanliness and Surface Treatment

*F. Dorner<sup>1</sup>, A. Hegel<sup>1</sup>, S. Nagaraja<sup>2</sup>, A.R. Pelton<sup>2</sup>, and N. Feth<sup>1</sup>*

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### Wear Characterization of Nitinol Wire

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## Fatigue I

### Cyclic Response and Fatigue Failure of Nitinol Under Tension-Tension Loading

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### The Effect of Temperature on Superelastic Fatigue of NiTi Filaments

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### The Role of Stress State on Nitinol Fatigue

*P. Briant<sup>1</sup>, S. Easley<sup>1</sup>, W. Lane<sup>1</sup>, M.L. Bowers<sup>1</sup>, L.G. Malito<sup>1</sup>, J.E. Schaffer<sup>2</sup>, and B. James<sup>1</sup>*

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### Experimental Determination of and Microstructural Influence on Crack Growth Rates during Thermomechanical Cycling of NiTi and NiTiHf Shape Memory Alloys

*B. Young<sup>1</sup>, C. Hayrettin<sup>1</sup>, T. Baxevanis<sup>2</sup>, I. Karaman<sup>1</sup>, and D.C. Lagoudas<sup>1</sup>*

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### Finite Element Analysis Of Sputtered Nitinol Specimen For Medical Applications And Experimental Evaluation Of Their High Cycle Mechanical Fatigue Behavior

*J.L. Gugat<sup>1</sup>, C. Bechtold<sup>2</sup>, R.L. de Miranda<sup>1</sup>, C. Chluba<sup>2</sup>, and E. Quandt<sup>1</sup>*

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### Characterizing Dynamic Changes in Superelastic Properties In-Situ High Cycle Linear Fatigue Testing of Nitinol Wire Z-Specimen

*M. Ehrlinspiel, A. Pequegnat, and W. Heitmann*

*Memry Corporation, Bethel, Connecticut, USA*

## Phase Transformations I

### B2=>B19'=>B2T Martensitic Transformation as a Mechanism of Plastic Deformation of NiTi

*P. Sittner<sup>1</sup>, L. Heller<sup>1</sup>, H. Seiner<sup>1</sup>, P. Sedlak<sup>1</sup>, O. Molnarova<sup>1</sup>, O. Tyc<sup>1</sup>, L. Kaderavek<sup>1</sup>, and Y.C. Chen<sup>2</sup>*

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### Dynamic SEM Characterization of Phase Transformations in Ti-Ni Alloys Processed by Various Treatments

*M. Nishida*

*Kyushu University, Kasuga, Japan*

## **Using Advanced Characterization to Provide Insights into Mechanisms of Functional Fatigue in Shape Memory Alloys**

*M.J. Mills*

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## **Crack Propagation Mechanisms of an Aged Nickel-Titanium-Hafnium Shape Memory Alloy**

*B. Amin-Ahmadi<sup>1</sup>, R.D. Noebe<sup>2</sup>, and A. Stebner<sup>1</sup>*

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## **Microstructural Evolution and Strain Recovery Characteristic of Proton-Irradiated Ni-51.4at.%Ti Thin Films**

*H.Z. Wang<sup>1</sup>, X.Y. Yi<sup>1</sup>, S.B. Sun<sup>1</sup>, W. Cai<sup>1</sup>, Z.Y. Gao<sup>1</sup>, and Y.Y. Zhu<sup>2,3</sup>*

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*(3)Liaoning Zhongwang Group Co. Ltd., Liaoning, China*

## **Recent Findings on the Effect of Aging Under Stress on Springback and Transformation Behavior of NiTi Shape Memory Alloys**

*H. Paranjape<sup>1</sup>, B. Marsh<sup>1,2</sup>, A. Stebner<sup>3</sup>, A. Shamimi<sup>1</sup>, and T. Duerig<sup>1</sup>*

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## **Fatigue II**

### **Influence of Material Quality on the Performance of Peripheral Stents**

*M. Frotscher and Mr. Martin Kiekbusch*

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### **Determination of the Critical Flaw Size for Crack Growth in Nitinol Material Used for Biomedical Applications through Focused Ion Beam Notch Fatigue**

*L.G. Malito<sup>1</sup>, M.L. Bowers<sup>1</sup>, P. Briant<sup>1</sup>, A. Shamimi<sup>2</sup>, and T. Duerig<sup>2</sup>*

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### **Effects of Tube Processing on the Fatigue Life of Nitinol—Part 2**

*P. Adler<sup>1</sup>, R. Frei<sup>2</sup>, M.L. Bowers<sup>3</sup>, P. Briant<sup>3</sup>, B. James<sup>3</sup>, and C. Liu<sup>1</sup>*

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### **Consideration of the Significance of Cold Work for Fatigue of Nitinol Medical Implants**

*K. Plaskonka-Weisenburger<sup>1</sup>, S.M. Pelton<sup>2</sup>, T. Jörn<sup>2</sup>, R. Hoffmann<sup>2</sup>, A. Keck<sup>1</sup>, J. Ulmer<sup>3</sup>, S. Payman<sup>4</sup>, and A.R. Pelton<sup>2</sup>*

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### **Impact of Inclusions on Fatigue of Medical Grade Nitinol Tubing Materials**

*Y.X. Xu, H.C. Cao, S. Tripathy, and M.H. Wu  
Edwards Lifesciences, Irvine, California, USA*

### **The Effect of Additions during Nitinol Melting to Improve Fatigue Performance**

*B. Stehulak  
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### **Improving Fatigue: Role of the R-Phase**

*A. Shamimi, C. Bonsignore, and T. Duerig  
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### **Enhanced Fatigue Resistance of Nanocrystalline NiTi by Laser Shock Peening**

*Mr. K. Yan and Q.P. Sun  
The Hong Kong University of Science and Technology, Hong Kong*

## **Phase Transformations II**

### **Features of Nanosubgrained Structure in Deformed and Annealed Ti-Ni SMA**

*S. Prokoshkin<sup>1</sup>, S. Dubinskiy<sup>1</sup>, and V. Brailovski<sup>2</sup>  
(1)National University of Science and Technology, Moscow, Russia  
(2)Ecole de Technologie Superieure, Montreal, Quebec, Canada*

### **Comparative Study of Microstructure, Transformation Behavior and Functional Properties of Titanium Nickelide with Various Grain Size**

*E.P. Ryklina, K.A. Polyakova, and S. Prokoshkin  
National University of Science and Technology, Moscow, Russia*

### **Surprising Results from Looking Under the Surface of Nickel-Titanium Single Crystals with 3D X-Ray Diffraction**

*A.N. Bucsek<sup>1</sup>, H. Seiner<sup>2</sup>, H. Simons<sup>3</sup>, P. Cook<sup>4</sup>, C. Yildirim<sup>4</sup>, D. Dale<sup>5</sup>, P. Ko<sup>5</sup>, Y.I. Chumlyakov<sup>6</sup>, C. Detlefs<sup>4</sup>, and A. Stebner<sup>7</sup>  
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(6)Tomsk State University, Tomsk, Russia  
(7)Colorado School of Mines, Golden, Colorado, USA*

### **Non-Destructive Methods for Nitinol Microstructure Characterization**

*K. Plaskonka-Weisenburger<sup>1</sup>, G. Sedlmayr<sup>1</sup>, A. Keck<sup>1</sup>, M. Samadi-Khoshkhou<sup>2</sup>, and A. Pfeifer<sup>2</sup>  
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### **Functionally Graded Ni-Ti Shape Memory—Production And Characterization**

*F.M. Braz Fernandes<sup>1</sup>, E. Camacho<sup>1</sup>, P. Freitas Rodrigues<sup>1</sup>, P. Inácio<sup>1</sup>, T. Santos<sup>1</sup>, and N. Schell<sup>2</sup>  
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## **Strain Glass and Novel Properties**

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*(2)National Institute for Materials Science, Tsukuba, Japan*

## **Processing-Induced Strain Glass Alloys in NiTi-Based Shape Memory Alloy Material Systems**

*R.W. Wheeler<sup>1</sup>, C.Y. Lee<sup>1</sup>, J. Smith<sup>1</sup>, N.A. Ley<sup>1</sup>, A. Giri<sup>2</sup>, and M.L. Young<sup>1</sup>*

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## **Plenary Session**

### **Shape Memory Thin Films**

*Prof. Eckhard Quandt*

*University of Kiel, Kiel, Germany*

## **Modeling: Theory and Experimental Validation I**

### **Relation between Strain Localization Front Movement and Fatigue Lifetime in NiTi Shape Memory Alloys**

*H. Paranjape<sup>1</sup>, A. Shamimi<sup>2</sup>, C. Bonignore<sup>3</sup>, and T. Duerig<sup>2</sup>*

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*(2)Confluent Medical Technologies, Fremont, California, USA*

*(3)NDC Medical Development, Nitinol Devices & Components, Fremont, California, USA*

### **Comparing Finite Element Predictions and Image-Based Measurements of Strain in a Nitinol Medical Device: A Verification, Validation, and Uncertainty Quantification (VVUQ) Study**

*K.I. Aycock<sup>1</sup>, K. Senthilnathan<sup>2</sup>, C. Bonignore<sup>2</sup>, R.L. Campbell<sup>3,4</sup>, J.D. Weaver<sup>1</sup>, T.M. Morrison<sup>1</sup>, and B.A. Craven<sup>1</sup>*

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*(2)Confluent Medical Technologies, Fremont, California, USA*

*(3)The Pennsylvania State University, University Park, Pennsylvania, USA; <sup>4</sup>Applied Research Laboratory, State College, Pennsylvania, USA*

### **Comparison of Experimental and Numerical Data for Nitinol Peripheral Stent Fatigue Prediction**

*F. Berti<sup>1</sup>, P.J. Wang<sup>2</sup>, G. Pennati<sup>1</sup>, F. Migliavacca<sup>1</sup>, E.R. Edelman<sup>2</sup>, and L. Petrini<sup>1</sup>*

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*(2)Massachusetts Institute of Technology, Cambridge, Massachusetts, USA*

### **Validation and Application of DIC In Superelastic Nitinol**

*C. Goreham-Voss, J. Schneider-Martin, and M. Schendel*

*Medtronic, Mounds View, Minnesota, USA*

### **On the Prediction of Activated NiTi B19' Martensite Twins beneath a Spherical Indenter**

*S. Pfeiffer and M.F.-X. Wagner*

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## Novel Applications I

### A Two-Stage Elastocaloric Cooler for Increased Temperature Span

*R. Snodgrass and D. Erickson  
Cornell University, Ithaca, New York, USA*

### Experimental Determination of Elastocaloric Latent Heat

*N. Michaelis, F. Welsch, S.M. Kirsch, S. Seelecke, and A. Schütze  
Saarland University, Saarbrücken, Germany*

### Continuous Operating Elastocaloric Cooling Device: First Experimental Results

*S.M. Kirsch, F. Welsch, N. Michaelis, P. Motzki, A. Schütze, and S. Seelecke  
Saarland University, Saarbrücken, Germany*

### Tube-Based Ni-Ti Porous Structures for Elastocaloric Cooling

*L. Porenta, M. Čebren, M. Brojan, A. Žerovnik, Ž. Ahčin, S. Zupan, and J. Tušek  
University of Ljubljana, Ljubljana, Slovenia*

### Spatial Phase Fraction Analysis from In-Situ XRD Experiments of SMA Knitted Actuators

*K. Eschen, J. Garcia-Barriocanal, and J. Abel  
University of Minnesota, Minneapolis, Minnesota, USA*

## Modeling: Theory and Experimental Validation II

### Modeling and Simulations of Coupled Transformation and Plasticity in NiTi

*P. Sedlak, M. Frost, H. Seiner, L. Heller, and P. Sittner  
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### Macroscopic Localization Patterns in NiTi: Numerical Reconstruction of Experimental Observations

*M. Frost<sup>1</sup>, P. Sedlak<sup>1</sup>, T. Ben Zineb<sup>2</sup>, L. Heller<sup>1</sup>, and P. Sittner<sup>1</sup>  
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### Predicting the Effect of Crystallography on the Performance of High-Temperature Shape Memory Alloys Subjected to Viscoplastic Deformations

*P.S. Chaugule and J.B. Le Graverend  
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### Potential Distortion of FEA Modeling Results Using ASTM Conforming Tensile Test Method

*D. Janda, C.C. Lasley, and Charlie Center  
W.L. Gore & Associates, Flagstaff, Arizona, USA*

### Live Observation of Nanoscopic Stress Concentrations and Transformation Fronts in Nickel-Titanium Using In-Situ Synchrotron 200 nm X-Ray Diffraction Coupled with Indentation

*J. Keckes<sup>1</sup>, J. Todt<sup>2</sup>, J. Zalesak<sup>2</sup>, M. Burghammer<sup>3</sup>, J. Kopecek<sup>4</sup>, and L. Heller<sup>4</sup>  
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(3)ESRF, Grenoble, France

(4)Czech Academy of Sciences, Prague, Czech Republic

### **Continuous Operating Elastocaloric Cooling Device: First Modeling Results**

*F. Welsch, S.M. Kirsch, N. Michaelis, P. Motzki, A. Schütze, and S. Seelecke*  
Saarland University, Saarbrücken, Germany

### **An Experimental Setup to Perform Uniform Tensile Tests of Superelastic NiTi Tubes or Wires**

*T. Alonso, N. Connesson, and D. Favier*  
Université de Grenoble Alpes, Grenoble, France

## **Novel Applications II**

### **Investigation of Damping Properties of NiTi and NiTi-Based SMA Samples: Correlation with Microstructure and Perspectives in Aerospace and Biomedical Applications**

*E. Villa, A. Nespoli, and F. Passaretti*  
CNR- ICMATE Sede di Lecco, Lecco, Italy

### **Macro- and Mesoscale Simulation of Superelastic Damping in Miniature Devices**

*S. Ahmadi<sup>1,2</sup>, K. Jacob<sup>1</sup>, F. Wendler<sup>2</sup>, and M. Kohl<sup>1</sup>*  
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(2)Institute of Materials Simulation, FAU, Fürth, Germany

### **Magnetic Field Controlled Superelasticity and Damping Properties of NiMnGa/Polymer Composites**

*V.A. Chernenko<sup>1</sup>, P. Sratong-On<sup>2</sup>, J. Feuchtwanger<sup>3</sup>, and H.i Hosoda<sup>4</sup>*  
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(2)Tokyo Institute of Technology, Tokyo, Japan  
(3)University of the Basque Country, Bilbao, Spain  
(4)Tokyo Institute of Technology, Yokohama, Japan

### **Shape Memory Alloys: A New Paradigm in Tires**

*S.A. Padula<sup>1</sup>, C. Creager<sup>1</sup>, D.J Gaydos<sup>2</sup>, D.J. Forbes<sup>3</sup>, and J.E. Schaffer<sup>3</sup>*  
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### **Design of Knitted Superelastic Tire Treads for Next Generation Non-Pneumatic Rover Tires**

*H. Koon<sup>1</sup>, J.E. Schaffer<sup>2</sup>, S.A. Padula<sup>3</sup>, and J. Abel<sup>1</sup>*  
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## **Plenary Session**

### **Additive Manufacturing—From 3D-Printing to 4D-Printing**

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## Actuation

### Morphing Cover for Front Fender Opening Using SMA Hinge to Reduce Aerodynamic Drag

*R. Tsuruta<sup>1</sup>, U. Gandhi<sup>1</sup>, C. Trager<sup>1</sup>, M.A. Gummin<sup>2</sup>, and E. Itakura<sup>3</sup>*

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*(3)Toyota Motor Corporation, Susono, Japan*

### Spanwise Adaptive Wing: An Overview and Challenges of In-Flight Wing Folding Using Shape Memory Alloys

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### Spanwise Adaptive Wing: Coupled Shape Memory Alloy Tubes for High Torque Applications

*M. Bass<sup>1</sup>, J.H. Mabe<sup>1</sup>, A.F. Lafranchi<sup>2</sup>, M. Allen-Prince<sup>1</sup>, and O. Benafan<sup>3</sup>*

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### Shape Memory Alloy Enabled Remote Control Actuated High Speed Cryogenic Wind Tunnel Models

*D.E. Nicholson<sup>1</sup>, F.T. Calkins<sup>2</sup>, M.A. Sleppy<sup>3</sup>, M.S. Carpenter<sup>3</sup>, A.F. Lafranchi<sup>2</sup>, S. von Deetzen<sup>4</sup>, M. Müller<sup>4</sup>, M.C.N. Wright<sup>5</sup>, H. Quix<sup>5</sup>, A.K. Hensch<sup>5</sup>, D.R. Saxer<sup>6</sup>, and C.J. Cramer<sup>6</sup>*

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### Biomimetic Avian Muscle Work Loop Emulation via Shape Memory Alloys

*P.B.C. Leal, M. Cabral, and D.J. Hartl*

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### Applications of Film and Foil-Based Shape Memory Alloy Devices

*H. Ossmer<sup>1</sup>, M. Gueltig<sup>1</sup>, C. Megnin<sup>1</sup>, B. Moradi<sup>1</sup>, D. Rastegar<sup>1</sup>, K. Kirchgassner<sup>1</sup>, L. Menken<sup>1</sup>, I. Kohlschreiber<sup>1</sup>, J. Zehnter<sup>1</sup>, C. Wessendorf<sup>1</sup>, F. Bruederlin<sup>2</sup>, K. Jacob<sup>2</sup>, and M. Kohl<sup>2</sup>*

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### Opportunities for SE/SMA Wire Used in a State of Uniaxial Compression Stress

*A.R. Austen<sup>1</sup> and J.E. Schaffer<sup>2</sup>*

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### A Toolbox for Selecting the Best Binary NiTi Actuator for Specific Applications

*C. Balkenbusch, W. Buchan, M. Rider, J. Davis, and S. Chaney*

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## **Development of Haptic SMA Actuators for Mobility Applications**

A.J. Czechowicz

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## **Amorphous-Crystalline TiNiCu Melt-Spun Ribbons for Micromechanical Applications**

N.N. Sitnikov<sup>1,2</sup> and A. Shelyakov<sup>1</sup>

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(2)Federal State Unitary Enterprise “Keldysh Research Center,” Moscow, Russia

## **Medical Devices**

### **Design Optimization for Nitinol Thin-Film-Based Flow Diverter Stents for the Treatment of Intracranial Aneurysms**

P. Velvaluri<sup>1</sup>, M. Pravdivtseva<sup>2</sup>, R.L. de Miranda<sup>3</sup>, O. Jansen<sup>2</sup>, and E. Quandt<sup>1</sup>

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(2)Kiel University Hospital, Kiel, Germany

(3)Acquandas GmbH, Kiel, Germany

### **The Effect of Platinum Content on the Multi-Physical Performance of Superelastic Nitinol Drawn Filled Tube (DFT®) or Neurovascular and Other Medical Devices**

J.L. Kolhoff

Fort Wayne Metals, Fort Wayne, Indiana, USA

### **Computational Investigation of Nitinol Guidewire Handling in a Tortuous Path**

D.J. McGrath<sup>1</sup>, R.N. Shirazi<sup>1</sup>, M. Moloney<sup>2</sup>, C. Higgins<sup>2</sup>, I. Mooney<sup>2</sup>, P.E. McHugh<sup>1</sup>, and W. Ronan<sup>1</sup>

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(2)Integer Holdings Corporation, Galway, Ireland

### **Performance Testing of Generic Heart Valve Frames Manufactured From Different Material Qualities (Gen I – III)**

C. Bräuner

ADMEDES GmbH, Pforzheim, Germany

### **Shape Memory Driven Intramedullary Nail for Bone Elongation**

J. Strittmatter<sup>1,2</sup>, R. Storz-Irion<sup>3</sup>, N. Hör<sup>1</sup>, and L. Bošković<sup>1,2</sup>

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3Beratung Entwicklung Produktoptimierung, RSI Consult, Emmingen-Liptingen, Germany

### **Development of a Hallux Valgus Orthodontic Appliance Using Cu-Al-Mn Superelastic Alloy**

S. Kise<sup>1</sup>, M. Hatori<sup>2</sup>, T. Kameda<sup>3</sup>, K. Ishikawa<sup>1</sup>, T. Omori<sup>4</sup>, and R. Kainuma<sup>4</sup>

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(2)Tohoku Kosai Hospital, Sendai, Japan

(3)Medical Footwear E-gas, Sendai, Japan

(4)Tohoku University, Sendai, Japan

### **A Workbench Applying Combined Loading Torsion-Bending Loading for Shape Memory Alloy Endodontic Files**

P. Xolin, S. Becker, F. Thiebaud, M. Engels-Deutsch, and T. Ben Zineb

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### **Self-knotting Sutures in Nickel-Titanium: Characterization and Numerical Modeling**

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### **Modular Instrument for the Minimally Invasive Surgery with SMA Actuation and Control**

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### **Flexible Nitinol-Based Implants with Integrated Electrode Arrays for Bioelectric Sensing and Stimulation**

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